ANALYZING THE MICRO-PROCESSES OF COLLABORATIVE CONCEPT GENERATION AT IDEATION STAGES: THE CASE OF INNOVATION-ORIENTED WEB COMMUNITY DISCUSSIONS

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Jovana KOVACEVIC [(1)], Sophie HOOGE [(2)], Albert DAVID [(1)]
[(1)] Management Lab, DRM, Paris-Dauphine University
[(2)] Center for Management Science, MINES ParisTech

Introduction

Among the many drivers of the efficiency of innovation and product development organizational processes, the quality of informal coordination among actors takes an important place. Concept generation is a key moment of upstream innovation processes. Innovative ideas can appear at any moment of the numerous formal and informal conversations that inevitably takes place. Collaborative innovation and product development practices also increase in many organizations and, within a number of organizations, community discussions are organized on-line, thanks to internal web-platforms. Computer-aided collaborative work systems are now widely adopted and the amount of on-line data, information or knowledge increases. Of course, a main future use of internal web-platform would be to support collaborative processes of concept generation and development.

The objective of this paper is to analyze the micro-processes of collaborative concept generation at ideation stages within innovation and product development projects. We have had the opportunity to take part, as co-animators, to on-line, innovation oriented, web community discussions. These on-line internal collaborations were efficient material for our research as, on the one hand, it embeds discussions of participants from several countries over the world within a large multinational company, and on the other hand, discussions started from a general theme, chosen as an innovation field, and were animated with the objective of generating innovative concepts for future products and services.

Our research question is the following: considering we have, as empirical material, the whole conversation as text made of the successive « posts » or contributions, is it possible to analyze how the final concepts were generated through the conversation? The purpose of this research is to investigate the micro-processes of an online collaborative concept generation at ideation stage in order to identify and describe archetypes defined by the patterns of analyzed interactions and their evolution towards innovative concepts. This study's first contribution will be methodological: how to analyze the empirical material so that the successive pieces of concepts, as cognitive entities, can be bracketed and interpreted? A second contribution will be on the dynamics of concept generation itself as it took place during these on-line conversations.

LITERATURE

Collaborative Web platforms for innovation and ideation

Previous research has already described a variety of approaches and techniques to support collaborative generation of a large number of ideas (Garfield, 2001; Knoll and Horton, 2011; Harvey, 2014). This literature states the importance and interdependence of *a cognitive*

process within individual group members and *a social process as group members interact* (Knoll and Horton, 2011).

With the spread of web 2.0 technologies, many industrial initiatives rely on new IT tools – such as mailbox, link on the intranet homepage, forum, and virtual platforms – which are more or less complex depending on the embedded possibilities to gather, organize, evaluate and select ideas (Westerski & Iglesias, 11). Firstly, IT tools present some common advantages for ideas generation: they are relatively inexpensive, easy to set up and reproduce, and enable search of information on knowledge management databases. Thus, existing innovation studies show that development of collaborative Web platforms facilitates social interaction, enabling different departments to gather knowledge and engage in idea generation (Michaelides et al. 2013). Secondly, as IT enables to screen the interactions between actors, idea management systems as virtual idea Platforms used to include knowledge management tools, both building a memory of interactions and feeding it, with proposals of information according used keywords or linking with other on-going ideation stream (Malhotra and Majchrzak, 2004; Song et al, 2007). Few researches highlight the impact of this new tools on the firm beyond idea generation and collection processes: monitoring and control of the learning process in knowledge management (Hayes and Walsham, G, 2001), stakeholders' involvement on idea nurturing and implementation (e.g. Bakker, Boersma and Oreel, 2006) and supporting organizational politics that contribute to the acceptance of new ideas (Hargadon and Douglas, 2001). Moreover, new managerial roles appear to facilitate these new collaborative interfaces. Elerud-Tryde and Hooge (2014) underlined a dual role of community managers of internal platforms: encouraging employee creativity in idea generation and involving employees and top managers simultaneously in the innovation process. Thus, Xiaomi et al. (2013) investigate the role of knowledge management to support Collaborative Innovation Community Capacity Building (CICCB) in order to enhance the effectiveness of innovation within the online community of employees.

Modeling micro-processes of collaboration during discussions

The analysis of innovative-oriented discussions that emerge on web platforms is included in conversational analysis research, which is a specific field of research for few decades. Thus, collaborative knowledge construction in asynchronous conferencing and e-learning environments are well documented in the literature (e.g. Kollar et al., 2003; Weinberger, 2003). Asynchronous text-based discourse can be used as research data (Mayer, 2004; Schrire, 2006), as all the communication elements are made explicit and being stored in the written contributions to the discussion. Furthermore, electronic discourse (Davis and Brewer, 1997) reflects and shapes the cognitive processes (Schrire, 2006), thus providing opportunities to analyze the characteristics of online interactions and to investigate individual contributions in the context of computer supported collaborative learning.

Research in this field is based on a variety of methodologies (e.g. Henri's model, 1992; the model of Gunawardena et al., 1997; the instrument of Zhu, 1996; the instrument developed by Pena-Shaff and Nicholls, 2004, etc.), content analysis techniques being often used to analyze transcripts of electronic discourse. In the Computer Supported Collaborative Learning (CSCL) literature, many researchers create new instruments for content analysis by modifying and advancing the existing instruments (De Wever et al. 2006). The research pioneers, who served as a base for subsequent research, were more focused on statistical data analysis (Henri, 1992), while more recent instruments use deep content analysis to investigate the social interaction and cognitive processes of collaborative knowledge construction (e.g. Pena-Shaff and Nicholls, 2004).

The Pena-Shaff and Nicholls instrument (2004) for knowledge construction processes evaluation is based on social constructivist learning theory framework. They investigate the communication patterns and the knowledge construction processes through qualitative analysis. They consider the knowledge construction process to be a social one, thus their framework is based on participation and interaction rates analysis (Pena-Shaff and Nicholls, 2004) from discussion transcripts. The author's analytical framework for content analysis proposes 11 coding categories to investigate social interaction within collaborative learning processes: *question, reply, clarification, interpretation, conflict, assertion, consensus building, judgment, reflection, support and other*. The authors use sentences within the messages as the unit of analysis; nevertheless the complete messages' transcripts are used for analysis in order to maintain meaning and semantic coherence.

Modeling the micro-processes of collaboration during concept generation

Despite conversation analysis has been studied, there has been little research that analyzes the micro-process of collaborative concept generation. In design theories, process of concept generation was studied as a synthesis from existing ones (Rothenberg 1979, Taura et al., 2005). In studies on cognitive linguistics, Fauconnier (1994) theory of mental spaces accounts for the cognitive processes of conceptualizing something as fused with something else, indicating that conceptual integration on two input mental spaces generate a third space ("the blend" process). Taura and Nagai (2012) highlight the concept generation process to be a synthetic one, defining the concept generation stage as a concept-synthesis process from two base concepts. Authors compared the concept generation process with the linguistic interpretation process, as they consider the concept synthesis as a compound phrase composed of two nouns (Taura and Nagai, 2012). In order to investigate the concept synthesis, they explored the new concept (expressed as a noun-noun phrase) from the viewpoints of thought types (*property mapping, concept blending and concept integration in thematic relation)* and recognition types (commonalities, *alignable and non-alignable difference*).

Commonality represents concept feature that is common or associated with both base concepts. Alignable difference is related to the "similarity", when both base and new concept features have different values along a single dimension (Markman and Wisniewski, 1997, Taura and Nagai 2012). Non-alignable difference is a kind of "dissimilarity", focused on a disparity between two features that have not a common dimension. Dissimilarity plays an important role in generating an innovative concept as it expends the thought space on the basis of a designer's inner-sense.

Taura and Nagai (2012) explained the notions *property mapping, concept blending and concept integration in thematic relation* as follows:

- "*Property mapping* is considered to involve the transfer of some features from an existing concept to another concept. Therefore, the feature recognized in property mapping is assumed to be an alignable difference since, in property mapping, the feature recognized in the existing concept displaces the corresponding feature in another concept (e.g. concept of 'white tomato' is generated by transferring the color of 'white' to the color of 'tomato').
- In *concept blending*, two input concept yield a third concept which inherent partial features from the input concepts and has emergent features of its own. The features recognized in the two synthesized concepts need not be alignable, since these two features are blended to yield a new concept (e.g. the concept of 'powdered ketchup' is concept blending, the recognized feature 'powder' is classified as a nonalignable

difference, since the corresponding feature of 'powder' is thought to be non-recognizable in 'tomato').

- An innovative concept that is generated based on thematic relation from the thematic scenes (situations, roles, etc.) is defined as *concept generation in thematic relation* (e.g. with respect to example of a 'snow tomato', the new concept of "refrigerator which can humidify the food in it" is generated from the scene where 'tomato' is stored in 'snow').

In their study, Taura and Nagai (2012) propose framework to investigate the generation synthesis using *the recognition types, thought types, creativity (originality and practicality) and the emergence of new features* as a research method. According to authors, concept blending can generate an innovative new concept as the concept synthesis extends beyond the categories of the given base concept. Therefore, concept blending represents the concept synthesis when high originality is pursued (*high order abstract concept*). In contrast, new concepts generated through property mapping concept synthesis (*first order concept generation*) are limited regarding its innovativeness, since it doesn't extend beyond the categories of the base concepts (Taura and Nagai, 2012).

To our knowledge, existing literature does not provide a generic framework to investigate the web based collaborative concept generation at ideation stages. We propose to empirically investigate this issue in the context of innovation-oriented online discussions. Furthermore, we aim to analyze which sequences of cognitive entities (*i.e.* groups of words corresponding to elementary ideas) explain the evolution of interactions between the participants and how initial ideas are, successfully or not, developed into concepts.

RESEARCH METHODOLOGY AND EMPIRICAL MATERIAL

To examine the above research question and provide the understanding of collaborative concept construction, an exploratory study was undertaken through collaborative research with an industrial firm. Based on a real case study (Yin, 1989) – i.e. analyzing conversations that really took place within a company - our research investigates the micro-processes of concept construction in an online debate in a virtual idea-generation environment.

In the present paper we report the empirical study that offers profound insights into innovation-oriented online discussions. Moreover, from a methodological standpoint being involved in the company during the organization and animation of the debate, enables the understanding of issues experienced on the field in order to direct the debate towards results that could be suitable for future product and service development according to company's strategic opportunities. In other terms, our role on the field was not just acting as participating observers. Some aspects of the relation we had with the field correspond to the action research tradition (Lewin, 1951; Coughlan and Coghlan, 2002; Hatchuel and David, 2007). Moreover, considering that managerial implications of our research include a contribution to designing efficient innovation-oriented on-line conversations, Kaplan's concept of "innovation action research" (1998) is relevant to take in to account the fact that beyond understanding the phenomena at stake, we aim at contributing to the design of techniques related to innovation and product development management. Within that research methodological and epistemological tradition, the researchers are also the designers of management methods (Hatchuel, 2005).

Case study presentation and empirical material

In order to empirically investigate this issue in the context of innovation-oriented online discussions, the authors conducted and facilitated an online debate through collaboration with

a consulting firm. These on-line internal discussions took place within a large international group, involving participants from several countries over the world. The innovation-oriented online discussions were launched in the context of an online community of employees subdivided into thematic groups. We were in charge for the group dedicated to discussions over the Innovation related topics, with the objective of experimenting and to stimulating interactions within a group.
Our participation on this project reflects two different stages of the community development. The first stage was a preparation stage: the aim was to build a stronger collaborative culture within the community, to engage community members to regularly visit the group, to get to better know the community members and their interests and to motivate them to share as much as possible on their projects and on product development and innovation topics. In the second phase of the project we supported the community transformation into a more mature community: established communication among members, regular exchanges on innovation related topics (strategic opportunities for the company, current & future projects, etc.), enabling us to expend its usages beyond the ordinary discussions and calls for help. The idea of this phase was to capitalize on the mature community, who had learnt to share and to communicate information, by animating and leading the Community **to orientate their discussions toward innovation and to develop potentially innovative solutions** related to the company's objectives.
Precisely, the *innovation-oriented online discussions* were launched in the context of the online community of employees to allow its members to go beyond daily discussions and further explore one trend or opportunity for the group. Our role was to mobilize and stimulate collaborative innovation community capacity (Xiaomi et al., 2013) and creativity of community members during a whole week, in order to support the community ability to generate innovative concepts and ideas for the given topic. This article focuses on the second phase of community development, and more specifically on micro processes of concept generation during the innovation-oriented debates within online communities of employees.

Organization of the Innovation-oriented online discussions
Innovation-oriented debate organization can be managed at different stages of the process: preparation, debate animation and results analysis towards identification of salient innovative concept proposals.

Preparation stage starts with the identification of potential themes for online innovation-oriented debates. To this end, theme selection was based on three main criteria: community members' interest into a specific topic domain, its potential to satisfy company's needs according to company's innovation strategy and the growing trends and the topic's potential for innovation and creativity. To identify a general theme for discussion that would engage members' interest and motivation, we looked back at the community thread for the period of three months in order to select the topic domains that proved to be of interest to community members. For this purpose, we only considered topic domains expressed in the post that initiated at least three members' interactions (comments on the post). Further, we confronted these topics to reports on growing tendencies in the field and on their opportunities for the company. During the selection process, animators (i.e., researchers in collaboration with a community manager from the consulting company) consulted the client to validate topic's alignment with strategic opportunities within the Group. Finally, the general theme was selected based on the authors' past experiences with creative workshops, to identify and formulate theme to support creativity and innovative proposals. The theme for the

innovation-oriented debate selected by researchers and validated by the client within the company was *"Message through the bottle"*.
Animation techniques within preparation phase also comprised identification and engagement of community members that could be particularly interested for the theme, according to their position within the company and our formal and non-formal interactions with the community's members, and thus contribute to the debate.

Debate animation refers to online ideation at early stages of innovation in the context of online community of employees. Debate "Message through the bottle" started from a general theme chosen as an innovation field, as previously stated, and were co-animated with a community manager from a consultancy firm, with the objective of generating innovative concepts for future products and services. In order to deepen discussions and to foster collaboration, researchers applied specific animation method based on principles of theories for creative design. Animators directed debate in order to inspire the community to propose related innovative concepts.
The debate action plan firstly aimed two weeks duration, organized in three phases, the last two being held in parallel and completely based on the first phase discussion: 1/General debate and opinion exchange, 2/ thematic debate and 3/Deepening propositions. By applying the basic principles of theories for creative design (Osborne, 1963) the first phase of debate comprised divergent discussions aimed to support interactions and exchanges among participants that would be rich with opportunities, in which their innovative ideas could emerge. Following the initial phase, we would then endeavor to identify and to point out the conceptual propositions with high potential for innovation, consistent with the company's strategic objectives. Further, the community manager's online synthesis of salient concepts is reviewed and voted on by the community. Following the online idea evaluation, the innovative concept with the most votes would be further developed into project proposal.

Thus, the *final debate phase* comprised the animation techniques to support collaborative work enabling innovative concepts to be designed towards project proposals. Researchers would then support formulation and design of innovative solutions based on Community propositions.

Overview of the online debate "Message through the bottle"
The online debate was launched on 10th December 2012 by community manager's initial post announcing the debate topic "Message through the bottle" and ended the 14th February 2013. Due to great participants' involvement and engagement, the debate lasted sixty-nine days in total. In the context of this study, we consider all comments altogether — including participants as well as community manager's comments — that resulted in eighty-two comments. Moreover, until the end of our intervention within the company's online community, the initial debate post was the most commented post on the company's platform (highest discussion ratio indicator). Twenty-nine community members from all over the world participated in the debate, thus involving seventeen company's affiliates business units.

After participants shared their general opinions on the topic and first conceptual propositions during the first week (first debate phase), Community Manager organized a vote of community members to select one sub-topic in order to deepen the debate in one, more focused, direction. Thus, three sub-topics that summarize discussed concepts, with most potential for innovation, were proposed to community for members online evaluation: 1/ Re-Invent the Talking bottle, 2/ Personalized Message (through the bottle), 3/ Message through

the bottle to connect people. Following the end of the voting process, community manager announced the sub-topic "Personalized message (through the bottle)" to be further developed and more deeply explored (second debate phase) during the debate on 19th December 2012.

The chosen sub-topic directed the debate towards conceptual solutions considering the notion of personalization in their propositions. Furthermore, during the second debate phase, five final concepts have emerged: 1/ personalized Customer Relationship Management (CRM) & personalized services, 2/ tactile packaging, 3/ personalized messaging on bottle label, 4/ spirits smell samplers, 5/ information & education on-trade via QR codes. These concepts, which were developed during the debate discussions among participants, were selected as final propositions by authors that animated the debate and validated by the company's representatives according to their innovativeness and practicality in regards to the company's objectives. In order to carry out this analysis, we analyzed genesis of each concept separately and this study focuses on the genesis of the concept "Personalized CRM & personalized services" as it was the most discussed concept of the debate and selected by the client as an innovative project proposal.

Limits of online discussions for Innovation-oriented discussions and adapted facilitation

The community's functioning as well as the nature and dynamics of online discussions are highly influenced by the community platform and its characteristics. Therefore, certain community management techniques are defined accordingly, to support the collaboration and community's dynamic during the debate. In the present case study, participants' interventions within the debate are structured in a chronological order following the initial post, building the hierarchical structure of participants' interventions. The structure of these conversations, as the interface makes it visible, sometimes makes the discussion thread difficult to read. This complexity of sequential conversation structure introduces the question of the interventions' lifetime (Marcoccia, 2006), regarding the time of posting, but also regarding its position within the discussion thread. Further, the higher the comment position, there are a less possibilities for the comment to be read and thus referenced in future participants' interventions. This is notably important when tracing the origins of collaborative concept generation.

In order to face the difficulties related to sequential discussion structure, appropriate community manager's activities for discussion animation were employed during our intervention. Firstly, same of the platform's features enabled authors to establish the basis for interactions among participants and for knowledge and resources sharing during the debate (e.g. the usage of the at sign, *'@'*, to notify members at the specific moments of debate or the usage of the hashtag sign, '#', transforming words into clickable links, thus enabling users to generate and to consolidate all related comments).

Secondly, in order to support members to openly express their thoughts on the subject and to interact with others upon theirs, which was aligned with the animation objectives for the first debate phase, we decided to not intervene in the discussion until the community members have exchanged at least three comments, especially during the increased community activity. In this context, we also limited our interventions as community managers to three consecutive comments. This allowed members to lead the discussion while community manager regularly proposed synthesis of ideas and concepts and helped members to evaluate and to select proposals that have potential for innovation. On the other side, this animation method does not appear to have any effective mechanism for referring and tracking process which would enable to effectively manage the transition from previous, "old", exchanges to those that

occur in real time within community manager's comments, this adding to the disruption of conversational structure and to the confusion related to its lecture by "interrupting" natural discussion course.

COMBINING ANALYTICAL FRAMEWORKS FROM INTERACTION ANALYSIS AND DESIGN THEORY

The context of our research implies two different aspects combined in our research question: collaborative online conversation and innovative concept generation. As previously stated, it seems that existing literature does not provide a generic framework to investigate the micro-processes of online collaborative concept generation at ideation stages. On the other hand, recent literature proposes efficient methodological solutions for each of these issues separately and the innovation oriented discussion managed within the online community of employees by authors represents a rich empirical setting to explore research objectives previously described, which precisely need the different method to be analyzed. Therefore, our proposition is to test the contribution of a generic framework that would combine two analytical frameworks in order to analyze how innovative concepts were build up from innovation-oriented discussions through community's members interactions. For this purpose, we conducted the analysis of every interaction and categorized and deeply analyzed the content of every message posted in the debate through the combination of Pena-Shaff and Nicholl's analytical framework for discussion (Pena-Shaff & Nicholls, 2004) and Taura and Nagai's design theory framework (Taura and Nagai, 2012).

An analytical framework from Interaction analysis: the step of discussions modeling

In order to obtain a greater understanding of observed discussions structured according to principals of theories for creative design, we firstly identified and categorized interactions among participants for the entire duration of the "Message through the bottle" debate, thus enabling us to further characterize every interaction in the context of concept generation. To this purpose, we applied qualitative analysis via Pena-Shaff & Nicholls (2004) theoretical framework, based on social constructivist learning theory. As previously stated, Pena-Shaff et Nicholls distinguish **eleven categories of indicators** (*question, reply, clarification, interpretation, conflict, assertion, consensus building, judgment, reflection, support and other)*, to analyze cognitive processes of learning taking place in asynchronous text-based computer conferencing environments.

The following paragraphs describe the application of this framework on the analysis of interactions and cognitive processes within innovation-oriented online community.
Firstly, we attempted to identify *communication patterns* within the debate "Message through the bottle" (1). Collected data included debate postings and a complete transcript of discussion (2) related to this debate (initial community manager's post and its comments). To this purpose, qualitative analysis was used to investigate cognitive processes within discussion by associating every interaction with a category and respective indicator or descriptor, according to Pena-Shaff & Nicholls's analytical framework. Hence, we applied their coding scheme to debate discussion to identify and categorize different types of social interaction for every message: *who is talking to whom, about what they are talking about, to which previous comment the message is referred to, how many times a message was referenced in following comments, how many members refer to same message, do they collaborate on a concept*.
For example, the participant's message "Have you heard of Sonic notify? It triggers sound from your mobile when you pass a sensor" is categorized with the indicator "Question", link

to the code *Discussion question* for the fist phrase and with the indicator "Clarification", associated to the code *Giving examples* for the second phrase of the message.

To carry out this research, we than modeled **a conversation diagram** (3) that graphically depicts the progress of the debate and the interactions among participants. The diagram provides a hierarchical structure of the comments posted in the debate, following the chronology of their reception, thus enabling to *a posteriori* observe the process of knowledge capitalization around the concepts generated during the discussion. Moreover, conversation modeling included identification of conversational situation for each message, aiming to identify moments in which collaboration among participants was triggered. Figure 1 here below summarizes the key steps of our method for analytical framework application to innovation-oriented online discussion analysis.

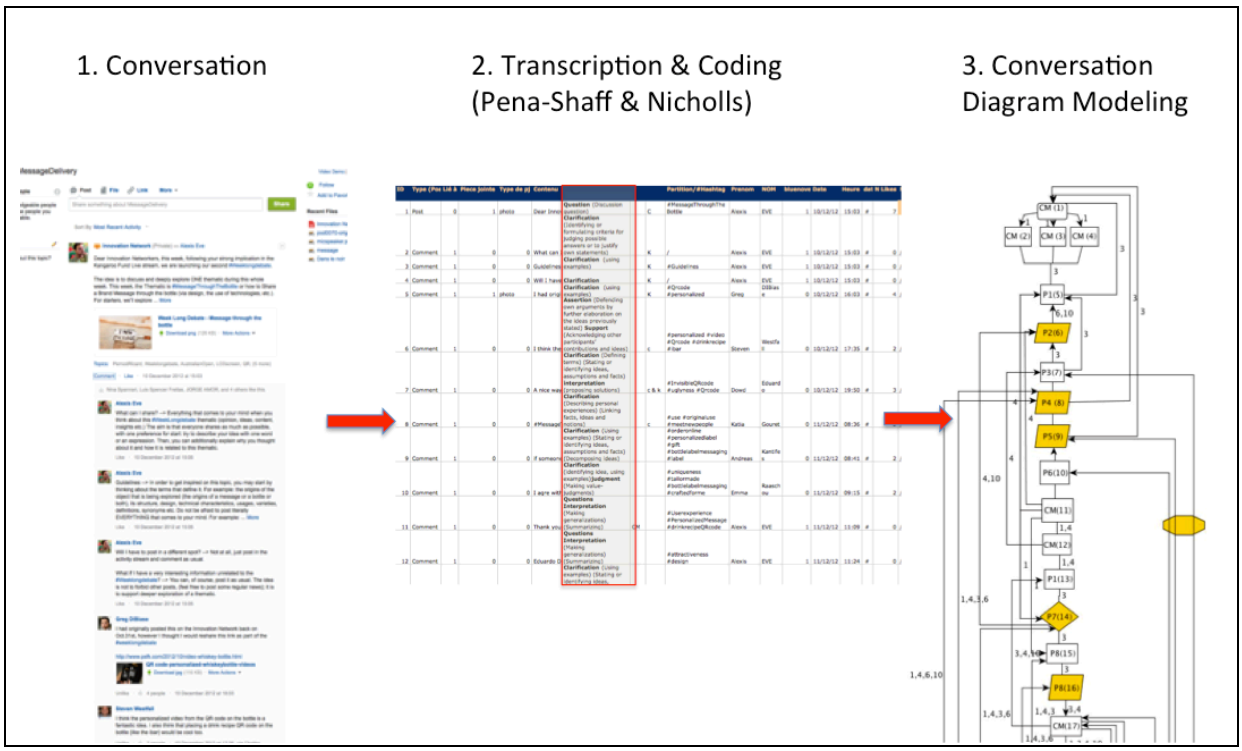


Figure 1 Key steps for Pena-Shaff & Nicholls (2004) framework application to innovation-oriented online discussions analysis

Pena-Shaff & Nicholls (2004) analytical framework enables to identify **communication patterns by categorizing social interactions** among debate's participants, while conversation diagram allows to trace all the messages corresponding to one discussion course thus referring the same discussion topic. However, this framework does not advance our understanding on **how these concepts are generated**. For that reason, we introduce the theory design framework, in order to explore the collaborative concept construction in the context of an online community of employees.

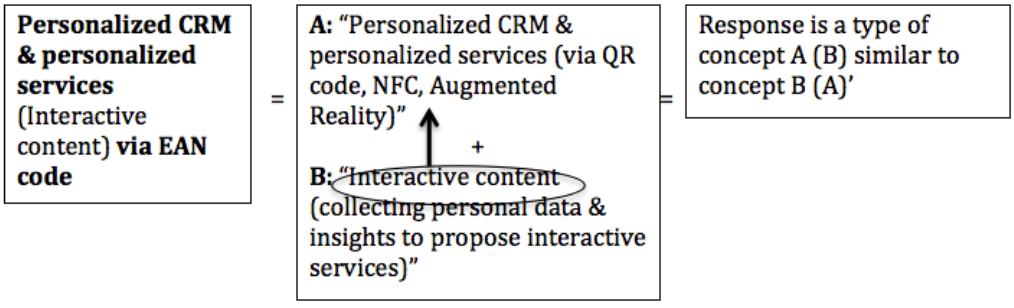
An analytical framework from design theory framework: The step of concept construction modeling

As previously stated, the aim of this research is to study the micro-processes of collaborative concept genesis. To achieve this, we applied Taura & Nagai's (2012) design theory framework in order to explore the thought types for each message containing an elementary idea or a concept. Furthermore, we aim to analyze which sequences of cognitive entities (i.e.

groups of words corresponding to elementary ideas) explain the evolution of interactions between the participants and how initial ideas are, successfully or not, developed into concepts.
Central to this method application was identification of messages expressing an idea or a concept and its evolution. To do this, we one more time conducted **an analysis of the discussion thread** (1), performed with the focus firmly on a content of each message. Once we **identified and selected posts with conceptual contributions** (2)**,** the focus of data analysis was set on how ideas and concepts have been developed through participants' interactions. To answer this question we first had to identify the origins of each idea and concept by tracing previous messages that reflected its evolution towards final conceptual proposition. **Tracing origins of each conceptual proposition** (3) was completely based on the conversation diagram, modeled in the prior phase, which indeed tended to categorize communication patterns and members interactions. In order to establish new discussion diagram for a specific concept, the initial diagram was simplified by extracting and keeping only interactions and messages that directed the specific concept evolution and contributed to its emergence. Thus, discussion diagram enabled us *to identify the base concepts that lead to the genesis of a new one, by following the logic of referring processes within the model*. Furthermore, this study analysis focuses on discussion diagram containing the only messages and interactions that contributed to the emergence of the "Personalized CRM & personalized services" concept.

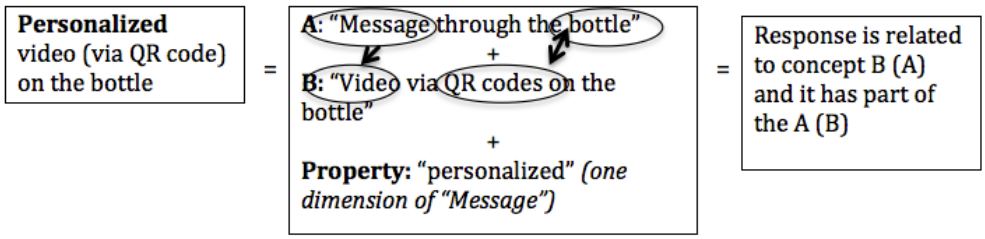
To deeply explore the micro-processes of concept generation through collaborative interaction we proceeded with **conversation synthesis in terms of concept generation** (4). This synthesis included keeping track of codes related to both frameworks for every message expressing an idea or a concept. These messages were analyzed and organized (annex 1) in a chronological order, following the exact dynamics of participants' interventions during the debate and contained all the intermediary concepts issued from the respective comments. Concept and intermediary concepts were reformulated for the synthesis purposes, in order to fit noun-noun formulation when possible (Taura & Nagai, 2012). Then, we deeply analyzed the concept related cognitive entities within each message, in order to better define the final concept and to explore its genesis through related intermediary base concepts that supported the synthesis of the new one. To this end, we **applied Taura and Nagai's categories to qualify generation mechanisms** (5), by analyzing the recognition type occurred between base concepts that we consider to have directed the synthesis of the new one. Here below, we report an analytical process conducted in order to categorize the concept genesis through classification standard of the thought types (Taura & Nagai, 2012), illustrated with examples.

1. Property mapping: "personalized CRM & personalized services (Interactive content) **via EAN code"**



Concept represents a ***Property Mapping*** standard of the thought type, as it is a type of concept A (B) similar to B (A): response is a type of A (B) as it is understood in the framework of a apart of the property of concept "Personalized CRM & personalized services via *other than* QR code, NFC, Augmented Reality" (that is EAN code), is transferred to concept B (A)' which is to create interactive content for the consumer.
It seems important to notice that this concept was one of the final propositions presented to the client as a result of the debate.

2. Concept blending: "Personalized video (via QR code) on the bottle"

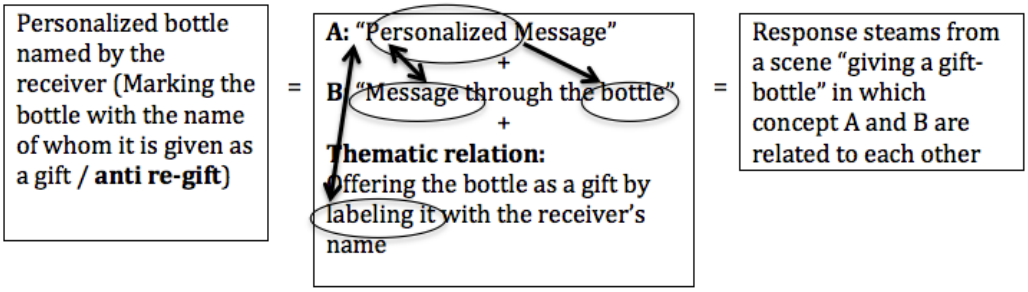


Concept is the response that has the properties of both concepts A ("Message through the bottle") and B ("video via QR codes on the bottle") and it is neither concept A nor concept B. *Moreover, developed concept is related to concept B (A) from the viewpoint of the material and it has part of the concept B (A).*

- Response is related to concept B (A) as the property "via QR codes" of "video" from the original concept B is associated to the bottle and the property "on the bottle" indicates a value of "through the bottle".
- Concept has part of the concept A (B) as "video" represents support for the "message through the bottle", thus the materialization of the "Message" from the original concept A. Also, the response contains the property "personalized" which is one dimension of the "Message" (message can be personalized).

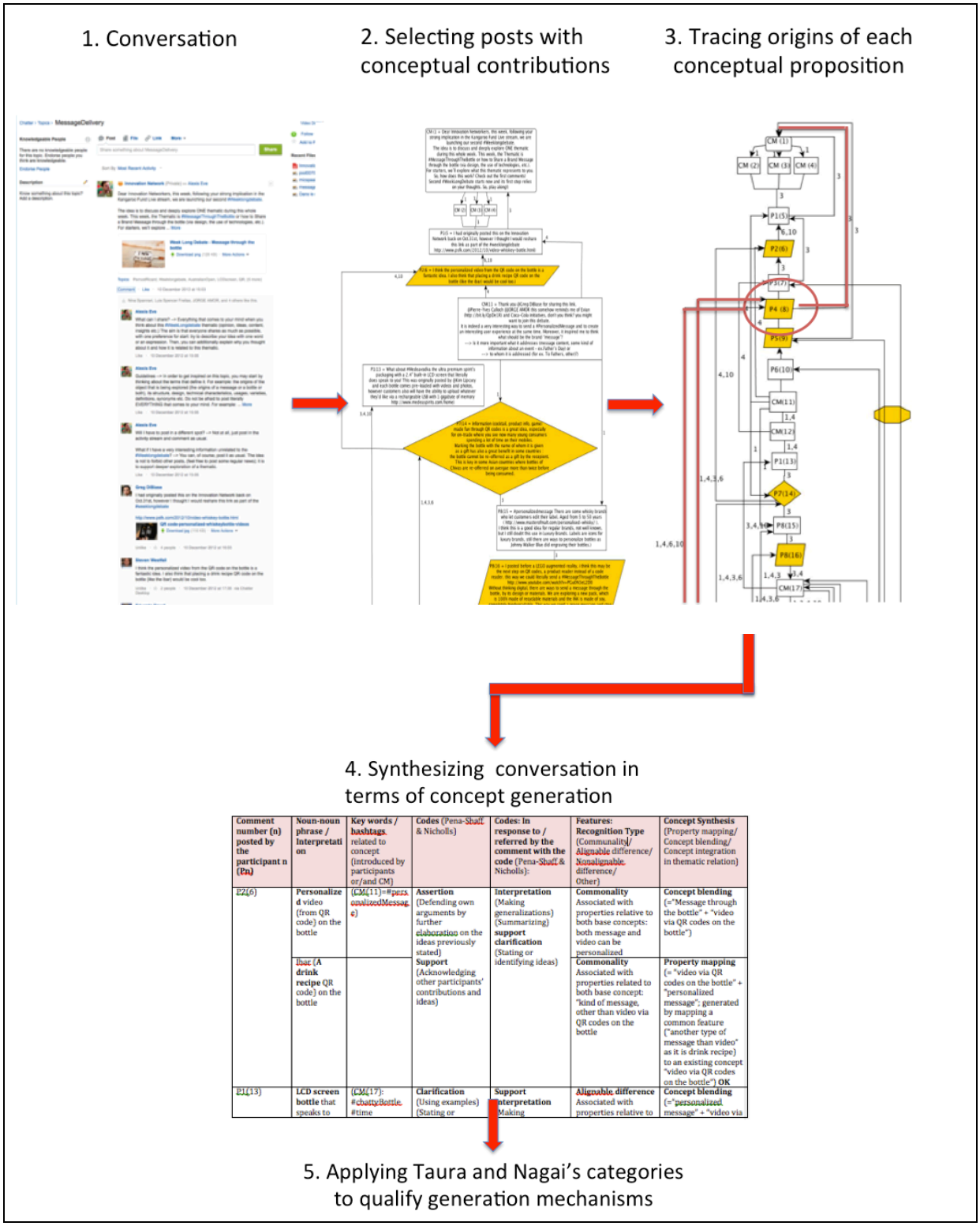
Therefore, we conclude that the thought type applied for this concept construction is ***Concept Blending***, by referring to Taura and Nagai.

3. Concept integration in thematic relation: "Personalized bottle named by the receiver (Marking the bottle with the name of whom it is given as a gift / **anti re-gift**)"



"Anti re-gift" concept stems from a thematic scene that is "giving a gift / offering the bottle as a gift", in which concepts A and B are related to each other. Response is a type of concept B (A) that is made of concept A (B)' resulting with the concept that uses property "personalized" from the original concept A to create one instance of the concept B (A): message through the personalized bottle. Furthermore, bottle is to be personalized by marking the bottle with the name of whom it is given as a gift, so it cannot be re-offered.
Therefore, the thought type standard applied for this concept generation is ***Concept Integration in Thematic Relation.***

Figure 2 is a quick review of key method steps regarding the design theory framework application on concept genesis analysis:



Comment number (n) posted by the participant n (Pn)	Noun-noun phrase / Interpretation	Key words / hashtags related to concept (introduced by participants or/and CM)	Codes (Pena-Shaff & Nicholls)	Codes: In response to / referred by the comment with the code (Pena-Shaff & Nicholls):	Features: Recognition Type (Communality/ Alignable difference/ Nonalignable difference/ Other)	Concept Synthesis (Property mapping/ Concept blending/ Concept integration in thematic relation)
P2(6)	**Personalized** video (from QR code) on the bottle	(CM(11)=#personalizedMessage)	**Assertion** (Defending own arguments by further elaboration on the ideas previously stated) **Support** (Acknowledging other participants' contributions and ideas)	**Interpretation** (Making generalizations) (Summarizing) **support clarification** (Stating or identifying ideas)	**Commonality** Associated with properties relative to both base concepts: both message and video can be personalized	**Concept blending** (="Message through the bottle" + "video via QR codes on the bottle")
	Ibar (**A drink recipe** QR code) on the bottle				**Commonality** Associated with properties related to both base concept: "kind of message, other than video via QR codes on the bottle	**Property mapping** (= "video via QR codes on the bottle" + "personalized message"; generated by mapping a common feature ("another type of message than video" as it is drink recipe) to an existing concept "video via QR codes on the bottle") **OK**
P1(13)	**LCD screen bottle** that speaks to	(CM(17): #cbottleBottle, #time	**Clarification** (Using examples) (Stating or	**Support Interpretation** (Making	**Alignable difference** Associated with properties relative to	**Concept blending** (="personalized message" + "video via

Figure 2 Key steps for Taura & Nagai (2012) framework application to innovation-oriented online discussions analysis

Finally, at this point we are able to recapture the general methodological framework proposed in this study. As pointed out, we firstly used the Pena-Shaff & Nicholls (2004) analytical

framework to identify communication patterns and to trace origins of each conceptual proposition through social interactions. Further, a discussion diagram was modeled in terms of concept generation, enabling a chronological preview of intermediary concepts and interactions that lead to a final innovative concept proposition. Lastly, we applied Taura and Nagai's theory design framework (2012), to qualify concept generation mechanisms by identifying the recognition type that resulted into a new concept.

As noted earlier, the context of our research implies two different aspects of our research question: collaborative online conversation and innovative concept generation. The instrument of Pena-Shaff and Nicholls (2004) served to identify patterns of collaborative online discourse during the debate, thus enabling to identify and categorize social interactions among participants. Although this instrument provides the categories and indicators conclusive with respect to our objective to determine characteristics of collaborative online discussion, it does not highlight the indicators related to concept generation mechanisms. To this purpose, we conducted a second analysis in order to understand the concept genesis processes for the identified innovative concepts. Taura and Nagai (2012) theory design framework served precisely to analyze micro processes of concept generation in this context. Therefore, the combination of these two analytical frameworks enabled us to investigate innovation-oriented collaborative online discussions and it results in a new and efficient method for innovation research.

LEARNINGS ON THE DYNAMICS OF CONCEPT GENERATION

Findings from this case study also offers insights into collaborative concept generation in the context of the innovation-oriented online discussions, and are presented in the following section.

Collective design of concepts: dynamics and iterations

Figure 3 is a chronological modeling of concepts emergence during "*Message through the bottle*" online debate. The figure aims to highlight the dynamics and iterations of collective concept design as resulting from the exploratory study. Concept-named bars of the graph represent all the intermediary concepts that lead towards the genesis of the final innovative concept "*Personalized CRM & personalized services (Interactive content) via EAN code*" which was selected by the client at the end of the debate. The first concept bar, in red, corresponds to the "oldest" concept referred by the intermediary concepts during the concept genesis. In this case, the oldest concept is extracted from the initial debate post, which indicates that the final concept was discussed throughout the debate. Blue concept bars, that illustrate the intermediary concepts issued from the respective comments, are placed in a chronological order, following the dynamics of their posting during the debate. The posting date and time of comments containing these concepts are marked on the axis on the left of the graph. The second red concept bar denotes the moment of the online voting process. As stated earlier, the community voted for the topic *"Personalized message (through the bottle)"* among three topics, discussed previously by participants and identified by the community manager. From this point of the debate, the discussion was oriented towards conceptual propositions that outlined the notion of personalization.

The black arrows trace the origins of every concept (according to Pena-Shaff & Nicholls analytical framework), starting with the base concept and ending with the bar that depicts the new generic concept for the given period of time. The figure shows that some concepts were referred several times in the forthcoming genesis processes (e.g. *"Personalized video (from QR code) on the bottle"*) while other only once or never (e.g. *"LCD screen bottle that speaks*

to you"). Moreover, study outline that some concepts were referring to only one base concept, showing that some of the participants invoked their personalize knowledge base outside the discussion range to generate new concept (e.g. *"Programed bottle (App that lets consumer program the bottle via unique code)")*. Further, the concept bars are colored in a lighter red and blue from the point the concept was no longer referenced.

On the top of the concept bars, cognitive type is shown thus qualifying the concept generation mechanisms according to classification standard of the thought types for each concept (Taura & Nagai, 2012). It appears that the final concept, identified as a concept with high potential for innovation by the client and animators, was generated through Property Mapping thought type. Furthermore, Property mapping is the most common concept generation mechanism, while Concept Blending and Concept integration in thematic relation are less usual, as each appeared only three times.

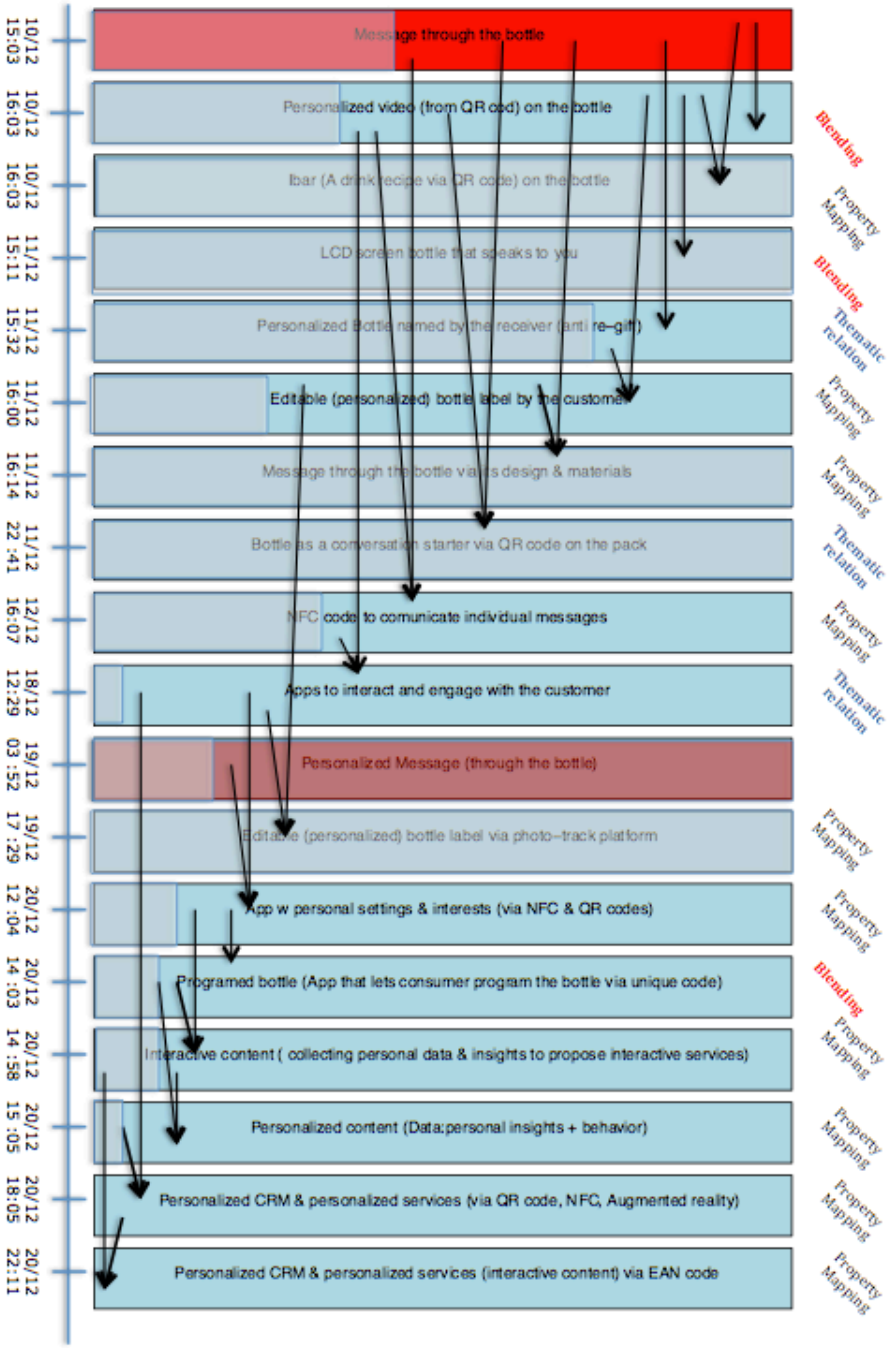


Figure 3: Chronological representation of collective design of concepts with conceptual genealogy

Discussion characteristics: conceptual emergence and deepening

Figure 4 explores the discussion characteristics in the context of concept generation in online innovation-oriented discussion, organized according to principals of theories for creative design. As already stated, the first part of innovation-oriented discussion concerns general debate and opinion exchange (1st debate phase) during the period of one week: concepts issued from the respective messages having numbers 1-49. Second discussion section started when community manager announced the selected sub-topic to the community (2nd debate phase), in the light of the voting process's results. This moment of the debate is depicted with the comment numbered 50, thus expressing the specific concept *"Personalized message (through the bottle)"*. The further discussion represents the debate deepening in one, more focused, direction (3rd debate phase) towards the innovative project proposal (number 61), illustrated by the evolution of intermediary concepts, numbered 54-60, while keeping track of their chronological posting order.

In the following figure, we marked for each concept the base concepts that contributed to its genesis. To illustrate this, a concept extracted from the comment numbered 20, represents the genesis of the base concepts that are extracted from comments 1 and 6, through the *concept integration in thematic relation* concept generation mechanism (Taura & Nagai, 2012).
Figure 4 thus illustrates results related to the *general structure of innovation-oriented online conversation*.

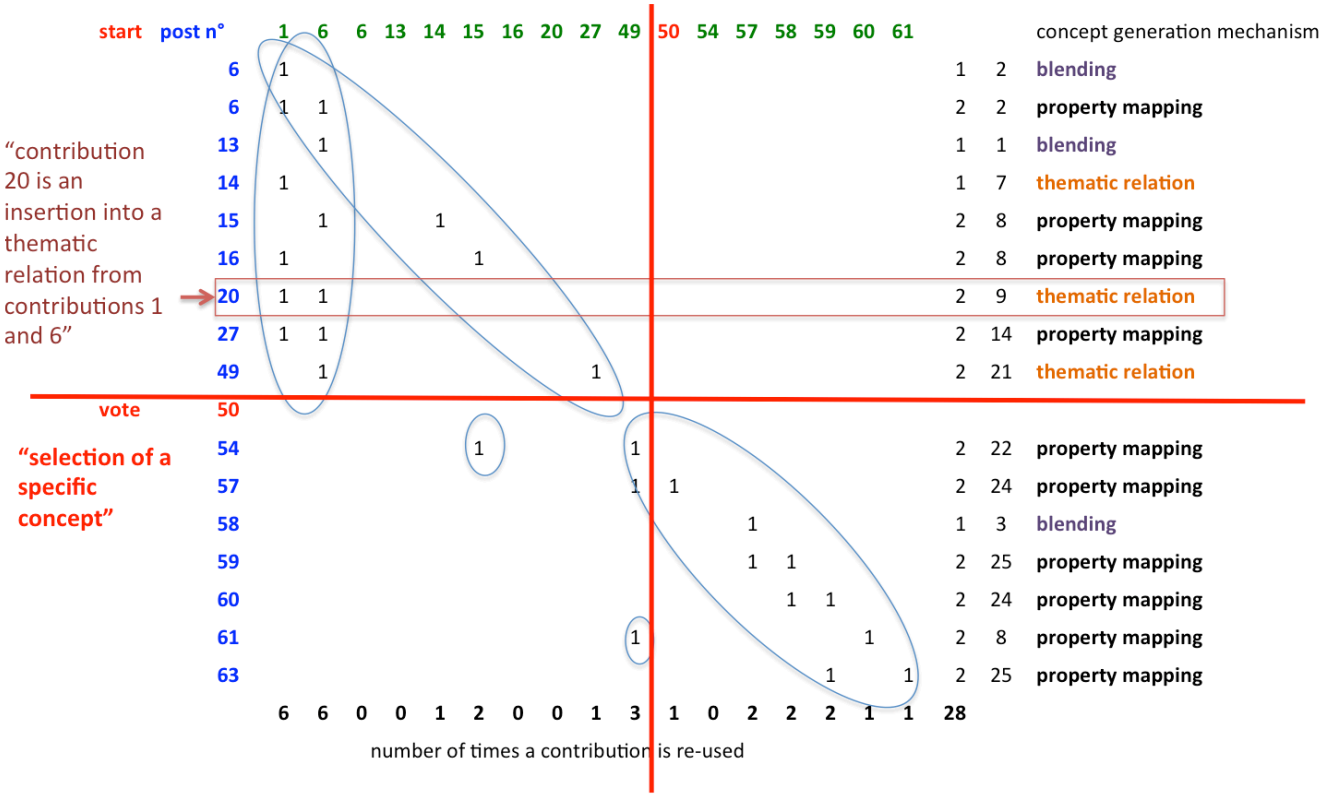


Figure 4 - Discussion characteristics: conceptual emergence and deepening

General structure of the conversation

During stage 1 (general discussion), we can observe *a mainly vertical structure* of conversation: each participant proposes something in response to initial posts, n° 1 or 2, i.e. without elaborating on other participants intermediary contributions. A smaller part of

contributions appear to form a more oblique structure on Figure 4: *oblique conversation structure* evidences that each contribution builds on immediate preceding ones, but this is marginal at stage 1, the structure of which being mainly vertical.
During stage 2 (in depth exploration after selection of the "Personalized message on the bottle" conceptual proposition), each conceptual contribution refers to immediately preceding ones. The structure of the conversation is mainly oblique, which reveals a more collaborative way of concept generation and building.

Micro-analysis of concept generation

In stage 1 (general discussion), we see from Figure 3 that six contributions directly refer to post n°1 (the initial conceptual proposition, "Message through the bottle") and six other contributions directly refer to post n°6, that contains the second conceptual proposition: "personalized video - from QR code - on the bottle"). Among the ten conceptual proposals, only six are re-used and explicitly contribute to further conceptual generation.

- "Personalized video from QR code on the bottle" is produced by conceptual blending (see p. 10) of conceptual contribution n°1 ("Message through the bottle") and external ideas ("personalization" as a possible property, in the mind of the participant for a message, "video" as a possible medium for a message, "QR code" as a possible way to generate the message).
- "Personalized bottle with the name of the receiver (anti re-gift)" is generated via inclusion into a thematic relation: conceptual contribution n° 1 ("Message through the bottle") is combined with the concept of "writing the name of the receiver on the bottle" as a way to personalize the bottle, and a value to that idea is proposed: the bottle cannot be re-offered. The concept thus formed is included into a very common and important theme within social relation: the concept of gift.
- Contributions 2 and 5 then produce conceptual proposition n°6 ("Editable (personalized) bottle label by the receiver)" through property mapping: the label on the bottle (proposition n° 5) becomes "editable by the receiver".
- "NFC codes to communicate individual messages" is generated through property mapping from the first and the second conceptual propositions (i.e. posts n° 1 and 6), without explicit reference to the 3 preceding conceptual propositions in the discussion. "Individual message" are a kind of message (a opposed to "collective", for instance) and NFC code is a alternative to QR codes as a way to generated the message.
- "Apps to interact and engage with the customer" is generated as an inclusion into another important thematic relation in social life: the moment when we "engage" a conversation and start to interact with someone. "Interact and engage with the customer" is the thematic relation, "apps" are the concrete support for engagement and interaction.
- Four concepts are proposed but not re-quoted or re-used to generate concepts: "iBar (a drink recepe via QR code on the bottle)","LCD screen bottle that speaks to you", "Message through the bottle via its design and material", "Bottle as a conversation starter via QR code on the pack". This does not means they have no value: they are only left aside by participants during the time of conversation.

In stage 2, we observe that only one contribution is left aside ("editable personalized bottle label via photo-track platform", the second conceptual contribution in stage 2) while all the others are re-used, as shown in Figures 3 and 4.

Finally, results show that *concept integration in thematic relation* generation type occurs only during the stage one of conversation that **is conceptual emergence.** On the other hand, no apparent correlation exists between structure of conversation ("parallel" vs. "collaborative") and generation type *property mapping* and *conceptual blending*. However, it seems important to note that *property mapping* generation type is strongly present in the stage two of conversation which designate the **collaborative concept-deepening** characteristic.

CONCLUSIONS & FUTURE RESEARCH

The case study analysis of the innovation-oriented discussion within the online community of employees enables us to address our research question. We present two sets of results: firstly, we try to establish a general framework enabling the analysis of an online innovation-oriented conversation; secondly, we describe the general conversation dynamics of concept generation itself as it took place during these on-line conversations. Thus, the **methodological contribution of this** exploratory study confirms that the combination of theoretical frameworks "Pena-Shaff and Nicholls" (2004) & "Taura & Nagai" (2012) enables analysis of the concept generation dynamics in innovation-oriented discussions. Furthermore, in this study we presented the key steps for their analytical application. Secondly, th e research **contributes to the knowledge on characteristics of discussion and the dynamics of concept generation.** This study points out two types of discussion dynamics: conceptual emergence and concept deepening which is a more collaborative stage of discussion.

Further, we identified correlation between discussion characteristics and concept generation thought types:

- Correlation between *thematic relation* and *concept emergence.*
- Strong links between *property mapping* and *deepening.*
- No apparent correlation conceptual blending and dynamic type.

While limited, this study aims to help researchers and practitioners to better understand the process of concept generation in an online environment and thus, provide the archetypes defined by the patterns of analyzed interactions.

Further research will be carried out to extend these case findings in relation to animator's role in community Management. In particular, we aim to explore how *Property Mapping*, *Concept Blending and Concept integration in thematic relation* could be used as animation techniques by Community Manager for concept generation.

Finally, the research underlined directions to improve sequential discussion: online conversion structure as well as certain community manager's animation techniques introduce difficulties related to conversation lecture. Accordingly, future research should investigate the possible contradiction between logic of *maximizing participation*, which refers to traditional community management and *maximizing creative concept generation* that results from Innovation oriented discussion.

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